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Title	NURSING STUDENT KNOWLEDGE ABOUT BREASTFEEDING: DESIGN AND VALIDATION OF THE APRENDELACT QUESTIONNAIRE
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Abstract

Background: Breastfeeding is the best source of food that a mother can offer her child during the first months of life because it provides multiple benefits for both the mother and the baby. Breastfeeding, despite being an innate act, requires qualified health professionals for advice and support. Objetives and participants: design and validate a questionnaire to evaluate nursing student breastfeeding knowledge. Methods and Design: Cross-sectional study. Construction and validation of the questionnaire was performed (content validity, test-retest reliability and internal consistency). Additionally, descriptive and bivariate analyses of sociodemographic variables and of the questionnaire results were conducted. Results: Optimum results were obtained in terms of internal consistency (KR-20 = 0.9) and test-retest reliability (ICC = 0.925). There were 144 participants with a mean age of 22.69 years. Statistical significance existed between the questionnaire score and the academic year, clinical practice, type of breastfeeding in childhood, knowing about support groups and participating in a breastfeeding workshop or course. Conclusion: A questionnaire on breastfeeding knowledge was validated. Nursing students progressively acquire breastfeeding skills as they advance in their undergraduate studies.

Keywords	Breast Feeding; Nursing; Surveys and Questionnaires; Validation study.
Taxonomy	Nursing Education, Survey Research, Women's Health
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No data was used for the research described in the article

NURSING STUDENT KNOWLEDGE ABOUT BREASTFEEDING: DESIGN AND VALIDATION OF THE APRENDELACT QUESTIONNAIRE

Cover letter

Dear Editor,

This paper shows the development and validation of an interesting questionnaire abour nursing student Knowledge. It has been validated in Spanish context but with an international projection, as is justified in the article. The details of authorship of the work are as follows:

- Águeda Cervera-Gasch, and Natividad Lopez Peña, conceived and designed the study, as well as analysed, interpreted data and written the article.
- Victor M Gonzalez-Chorda, and Desirée Mena Tudela supervised the whole process and reviewed the article, with important intellectual contributions.
- Maria Jesus Valero-Chilleron and Maria Pilar Suarez-Alcazar collected the data.
- The final version of the article was approved by the entire team.

The research team hopes that the work will be to your liking and accepting submission to peer review process and possible publication in your valued journal Nurse Education Today.

Sincerely,

Águeda Cervera-Gasch (on behalf of the research team).

NURSING STUDENT KNOWLEDGE ABOUT BREASTFEEDING: DESIGN AND VALIDATION OF THE APRENDELACT QUESTIONNAIRE

HIGHLIGHTS

- Breastfeeding is the best source of food that a mother can offer her child during the first months of life.
- To ensure the initiation and continuation of breastfeeding, health systems require qualified professionals capable of supporting, advising and informing women about breastfeeding

NURSING STUDENT KNOWLEDGE ABOUT BREASTFEEDING: DESIGN AND VALIDATION OF THE APRENDELACT QUESTIONNAIRE

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NURSING STUDENT KNOWLEDGE ABOUT BREASTFEEDING: DESIGN AND VALIDATION OF THE APRENDELACT QUESTIONNAIRE

Abstract

Background: Breastfeeding is the best source of food that a mother can offer her child during the first months of life because it provides multiple benefits for both the mother and the baby. Breastfeeding, despite being an innate act, requires qualified health professionals for advice and support.

Objetives and participants: design and validate a questionnaire to evaluate nursing student breastfeeding knowledge.

Methods and Design: Cross-sectional study. Construction and validation of the questionnaire was performed (content validity, test-retest reliability and internal consistency). Additionally, descriptive and bivariate analyses of sociodemographic variables and of the questionnaire results were conducted.

Results: Optimum results were obtained in terms of internal consistency (KR-20 = 0.9) and test-retest reliability (ICC = 0.925). There were 144 participants with a mean age of 22.69 years. Statistical significance existed between the questionnaire score and the academic year, clinical practice, type of breastfeeding in childhood, knowing about support groups and participating in a breastfeeding workshop or course.

Conclusion: A questionnaire on breastfeeding knowledge was validated. Nursing students progressively acquire breastfeeding skills as they advance in their undergraduate studies.

Key words: Breast Feeding; Nursing; Surveys and Questionnaires; Validation study.

INTRODUCCITON AND BLACKGROUND

Breastfeeding is the best source of food that a mother can offer her child during the first months of life. The World Health Organization (WHO), the United Nations Children's Fund (UNICEF) and other international organizations recommend initiating breastfeeding during the first hour of life of the newborn and exclusively breastfeeding until six months of age, subsequently introducing adequate complementary foods without abandoning breastfeeding for at least two years (Kim, Park, Oh, Kim, & Ahn, 2018; Smith et al., 2018).

Breastfeeding provides multiple benefits for the health of the mother and the baby. On the one hand, it protects the mother from cardiovascular diseases, osteoporosis, diabetes, and breast and ovarian cancer (Nguyen, Jin, & Ding, 2017; Unar-Munguía, Torres-Mejía, Colchero & González de Cosío, 2017). In addition, it provides psychological benefits, increasing the affective mother-child bond and decreasing postpartum depression (Chowdhury, et al., 2015). On the other hand, it favors the physical, sensory and cognitive development of the baby (Pang, et al., 2019), protects from infections such as pneumonia or diarrhea, decreasing morbidity and mortality (Motee & Jeewon 2014; Oribe et al.,2015), and prevents juvenile diabetes, lymphomas, cardiovascular diseases and obesity (Hui, et al., 2019).

The benefits of breastfeeding are evident. However, less than 40% of infants younger than six months receive breast milk as exclusive food worldwide (OMS, 2017). In Spain, breastfeeding is the predominant diet during the first six weeks of the infant's life, reducing to 53% at three months of life and to 28.5% at six months (Instituto Nacional de Estadística, 2016).

To ensure the initiation and continuation of breastfeeding, health systems require qualified professionals capable of supporting, advising and informing women about breastfeeding (OMS, 2017; Patel & Patel,2016), making it possible to reduce abandonment rates as the knowledge of professionals increases (Kim, et al., 2018). However, different studies

show evidence of a lack of knowledge about breastfeeding among doctors, pediatricians, midwives, and nurses (Mullan, 2015; Garner, et al., 2016; Baydar, et al., 2016; Gavine, et al., 2017 22. Medel-Marambio, Benadof, & Toro Huerta, 2017; Yang, Salamonson, Burns, & Schmied, 2018a).

Continuing education may have a fundamental role in this regard; however, there is no solid evidence on breastfeeding training for health professionals, and there is a critical need for research to address multidisciplinary education (Gavine et al, 2017). In addition, breastfeeding training should be initiated in the university setting, but the level of knowledge of nursing and medical students (Kakrani, Rathod, Mammulwar & Bhawalkar, 2015) and the self-efficacy of midwifery students (Melchionda, Aleti & Mauri, 2019) is not considered adequate, and there is a lack of validated tools to evaluate the level of knowledge health science students have regarding breastfeeding (Yang, Schmied, Burns, & Salamonson, 2018b).

Thus, the objective of this study was to design and validate a questionnaire to evaluate breastfeeding knowledge in nursing students at Jaume I University in Castellón de la Plana (Spain).

METHODS

Design

This was a cross-sectional study to design and validate a breastfeeding knowledge questionnaire for nursing students. The study was conducted between September 2016 and May 2017.

Setting and participants

The study was conducted with students obtaining their nursing degree from Jaume I University (Spain). The curriculum is structured across 4 years; students acquire knowledge about breastfeeding in a cross-disciplinary manner in subjects such as Human Nutrition (first

year), Health Programs in Childhood and Adolescence (second year), and Women's Care and Care in Childhood and Adolescence (third year).

The study population consisted of 240 undergraduate nursing students enrolled in one of the four years. The minimum sample size was established as 5-10 individuals per item, i.e., at least 140 participants (21 items) (Anthonie, Moret, Regnault Sébille & Hardouin, 2014). All students enrolled in the nursing program during the academic year 2016/2017 who were present in the classroom the day of data collection without prior notice were included. Students who did not wish to be part of the study or who had participated in the pilot test and those who did not fully complete the questionnaires were excluded.

Instrument validation:

First, a review of the literature was performed to define the construct and obtain the first version of the questionnaire. The PubMed, Cumulative Index to Nursing & Allied Health Literature and Cochrane databases were consulted, including articles from the last 5 years, as well as the Spanish clinical practice guide on breastfeeding (Ministry of Health, 2017). The descriptors breastfeeding, nursing students and validation studies were used. The first version, obtained by summarizing the content by the research team, comprised 29 items with four response options.

Second, content validity was studied using a nominal group formed by a heterogeneous panel of 7 experts in breastfeeding (pediatric nurses, midwives, research nurses, and lactation consultants). The experts received the initial version of the questionnaire by email one week before the nominal group session. One session was needed to reach adequate levels of consensus. The experts made some comments related to the phrasing of questions, and 8 items were eliminated.

Third, a pilot and cognitive pretest was conducted with a group of 7 nursing students to detect problems related to general comprehension and item responses. The formal appearance and the completion time were also assessed.

Fourth, the questionnaire was administered to students in the nursing program. The internal consistency of the instrument and the test-retest reliability were studied in a sample of 10 students at 14 days (Carvajal, Centeno, Watson, Martínez, & Sanz Rubiales, 2011). Figure 1 shows a summary of the validation process.

INSERT HERE FIGURE 1

Measurement

The breastfeeding knowledge questionnaire included 21 multiple-choice questions, with four options and only one correct response. One point was assigned per correct response, and zero points were assigned for incorrect or blank responses. The final score was obtained by weighting the sum of the correct responses relative to 100. Higher scores indicated greater breastfeeding knowledge. In addition, sociodemographic variables (age, sex, number of children), academic variables (previous studies, academic year), professional variables (clinical experience in maternity or newborn care) and personal variables (experiences in breastfeeding as a mother or father and type of breastfeeding in childhood) were analyzed.

Data collection

A review of the literature was conducted between September and December 2016, and content validity and the pilot test were carried out between December 2016 and January 2017. The questionnaires were administered in February and March 2017. Course coordinators were contacted, and a day and time for data collection during regular classes was specified. The questionnaire was administered at the beginning of the class by the researcher together with the teacher responsible for the course.

Data analysis

Internal consistency was analyzed using the Kuder-Richardson-20 test (KR-20 $\geq$ 0.7 indicates good consistency) (Bajpai & Bajpai, 2014), considering the responses as correct or incorrect. Intraobserver reliability was studied using the intraclass correlation index (ICC $\geq$ 0.75 indicates good agreement) (Koo & Li, 2016). Responses to the items in the questionnaire (percentage of correct responses) and the overall score (mean and standard deviation) were analyzed descriptively. The final score was related to the sociodemographic, academic and professional variables using nonparametric Mann-Whitney U tests in the case of two groups and the Kruskal-Wallis test in the case of three or more groups, as conditions were not met for applying parametric tests. The analysis was performed with SPSS and Excel. A level of significance of $p < 0.05$ was established.

Ethics considerations.

The Council of the Department of Nursing and the Vice Dean of the nursing program at university approved the study. Consent of the experts and students who participated in the study was obtained. The questionnaire did not collect personal data that would allow the participants to be identified, and its completion was completely voluntary. The ethical principles of the Declaration of Helsinki of October 2013 and the current legislation in Spain on the protection of personal data were respected (Ley Orgánica 15/1999, de 13 de diciembre, de Protección de Datos de Carácter Personal [Organic Law 15/1999, of December 13, on the Protection of Personal Data]).

RESULTS

Sociodemographic characteristics

A total of 144 questionnaires were collected. The mean age of the participants was 22.69 ± 6.17 years. A total of 79.9% (n = 115) were female, and only 4.9% (n = 7) had children. A

total of 78.3% (n = 112) were enrolled in the baccalaureate program, 36.1% (n = 52) were in the first year of the program, and 23.6% (n = 34) had clinical experience in maternity or newborn care. Only 4.2% (n = 6) of the sample had personal experience breastfeeding as a mother or father, and 45.8% (n = 66) were breastfed during childhood (Table 1).

INSERT HERE TABLE 1

Validity and reliability of the questionnaire

Based on the comments of the experts, some of the items in the questionnaire underwent small phrasing changes, and 8 were eliminated by consensus. The content of the initial questionnaire was restructured, and version 2 of the questionnaire was developed, consisting of 21 items on breastfeeding, with four response options, and sociodemographic, academic, professional and personal variables.

There were no comprehension problems for the items in the pilot test and the cognitive pretest, and the completion time varied between 8 and 10 minutes. The instrument presented excellent internal consistency (KR20 = 0.9) and test-response reliability (ICC = 0.925). After the completion of this process, the questionnaire was called *"AprendeLact*".

Breastfeeding knowledge

The mean overall score on the questionnaire was 55.85 (sd ± 26.53) points. The fourth-year students obtained the highest average score (m = 76.81 ± 12.64), and the first-year students had the lowest average score (m = 25.45 ± 12.82), with significant differences by year ($p < 0.001$). Table 2 shows a descriptive analysis of the overall score on the questionnaire and the success rate of each item.

INSERT HERE TABLE 2

Students with clinical experience in maternity or newborn care scored significantly higher (74.23 ± 14.55) than those who did not (50.17 ± 26.86) ($p < 0.001$). Type of breastfeeding in childhood also showed statistically significant differences ($p = 0.008$), with higher values for students fed with formula (67.13 ± 22.90) compared to mixed (53.82 ± 26.49) and exclusive breastfeeding (49.20 ± 26.78). Age, sex, number of children, and previous studies showed no significant differences ($p > 0.05$) (Table 3).

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DISCUSSION

Studies retrieved on breastfeeding knowledge in health science students use qualitative methodology (Palajic, 2014), study self-efficacy (Melchionda, et al, 2019), or attitudes or beliefs (Amin, Abdulrahman, Saab-Al-Muhaidib, & Abdulaziz-Al-Hamdan, 2014) or do not use validated questionnaires to determine the students' level of knowledge (Kakrani et al., 2015). While validated questionnaires do exist to determine the level of knowledge and skills (Gómez Fernández-Vegue & Menéndez Orenga, 2015) or knowledge and attitudes towards breastfeeding (Brodribb, Fallon, Jackson, & Hegney, 2008), they are directed to doctors and not to students of health sciences, especially nursing students.

In this study, the *AprendeLact* questionnaire was designed and validated for nursing students, satisfying the steps required in the literature in terms of content validity with the use of a nominal group (Harvey & Holmes, 2012), the number of experts (McMillan, King, & Tully, 2016), the size of the sample to study the psychometric properties (Anthoine et al., 2014) and the test-retest reliability (Carvajal, et al., 2011). The internal consistency was studied with KR-20, considering the responses as dichotomous variables (correct/incorrect) (Gómez Fernández-Vegue et al., 2015), obtaining excellent results. However, it should be noted that recently, the Australian Breastfeeding Knowledge and Attitude Questionnaire Short-Form, originally

validated in a sample of Australian doctors (Brodribb et al., 2008), was adapted and validated for Chinese nursing students, yielding good psychometric properties (Yang, Schmied, Burns, Brodribb & Salamonson, 2018c).

Scores on the questionnaire improved as the level of studies progressed, with significant differences among all years except between the third and fourth years, where the score stabilized. The level of knowledge about breastfeeding can be considered adequate at the end of nursing programs (70 points out of 100). This could be related to the cross-curricular teaching of breastfeeding knowledge because knowledge is imparted on breastfeeding in subjects such as Anatomy and Physiology (where the anatomy and physiology of the breast is explained) and Human Nutrition (promoting breastfeeding as the best source of food for infants) in the first year,; Health Programs in Childhood (assessment of a correct latching: position, postures, observation of feeding) and Public Health (what breastfeeding contributes to society: benefits, savings) in the second year; and two courses on maternal and child care (Women's Care (most frequent problems in breastfeeding related to women and how to solve them) and Care in Childhood and Adolescence (most frequent problems in children related to breastfeeding and how to solve them) in the third year. However, in the fourth year, there is no specific breastfeeding content in any subject, although there seems to be good knowledge retention. Interspersing breastfeeding content throughout the nursing curriculum is recommended in the USA (Spatz, Pugh, & American Academy of Nursing Expert Panel on Breastfeeding, 2007); however, no other studies have been found that analyze how the level of breastfeeding knowledge evolves throughout the curriculum.

Training in breastfeeding should not end when finishing university studies but should be continuous, updated and permanent (Meek, 2017; Pajalic, 2014), supporting the current need to promote breastfeeding but highlighting the lack of support and limited information on

breastfeeding for the population (Otmani et al., 2015; Yang, et al., 2018a). However, breastfeeding knowledge may decrease over time, influenced by the professional environment in which students develop or specialize or by personal experiences, among other possible factors. The retention of knowledge throughout professional nursing careers and the possible influencing factors should be determined with subsequent longitudinal studies.

Good advice to women who breastfeed requires adequate knowledge, skills and attitudes (Yang, Burns, Salamonso & Schmied, 2019). In this sense, it can be highlighted that the students who are involved in clinical practice related to breastfeeding (maternity, birth, newborn or pediatric care) achieved significantly higher scores. This result coincides with other studies (Jesus, Oliveira & Morales, 2017) (Yang et al., 2018b) and reinforces the need to link theoretical and practical training in breastfeeding.

Another relevant aspect to consider is personal experience because they may be related to the level of knowledge about breastfeeding and influence professional decisions (Darwent & Kempenaar, 2014). However, the results show that the students who were breastfed in childhood obtained significantly lower scores on the questionnaire and that there were no significant differences according to previous personal experience (having children or other reasons). It is true that the sample of students was small, but these results coincide with other studies (Brodribb, et al., 2008).

Limitations

Finally, the results of this study should be interpreted with caution because it is a cross-sectional study conducted in a single institution. In future studies, it will be necessary to expand the sample to other universities and science degrees to verify its validity and reliability. In addition, longitudinal studies should be conducted to determine how the level of knowledge of

students evolves and should include an assessment of skills and attitudes towards breastfeeding to determine their level of competence.

CONCLUSIONS

The *AprendeLact* questionnaire was designed and validated to evaluate breastfeeding knowledge in undergraduate nursing students. The constructed instrument has a KR-20 coefficient of 0.9 and an intraclass correlation coefficient of 0.925, having a high degree of reliability and internal validity, which allows reliably measuring the degree of breastfeeding knowledge in nursing students.

Different measures demonstrate that breastfeeding knowledge acquired by nursing students correlated with academic year, with the highest score being that of the fourth-year students.

Statistical significance exists between breastfeeding knowledge and academic year, clinical experience in maternity or newborn care and type of feeding in childhood.

CONFLICTS OF INTEREST: none

FUNDING: None

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Figure 1. Validation process

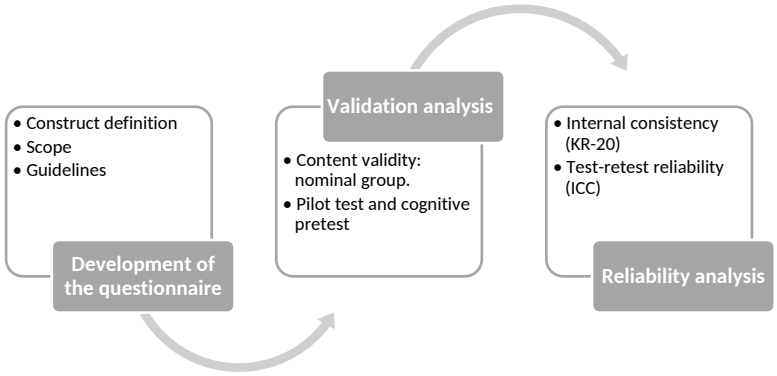

Table 1. Sociodemographic characteristics (N=144).

	1º (n=52)		2º (n=28)		3º (n=26)		4º (n=38)		Global score (N=144)	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Sex										
Female	37	71,2	26	92.9	18	69.2	34	89.5	155	79.9
Male	15	28.8	2	7.1	8	30.8	4	10.5	29	20.1
Children										
Yes	2	3.8)	0	0	4	15.4	1	2.6	7	4.9
No	52	96.2	28	100	22	84.6	37	97.4	137	95
Previous studies										
Vocational training	7	13.5	5	17.9	10	38.5	6	15.8	28	19.6
Baccalaureate program	45	86.5	23	82.1	14	53.8	30	78.9	112	78.3
University degree	0	0	0	0	1	3.8	2	5.3	3	2.1
Breastfeeding experience in maternity or newborn care										
Yes	0	0	3	10.7	11	42.3	19	50	34	23.6
No	52	10	25	89.3	15	57.7	19	50	110	76.4
Personal breastfeeding experience										
Si	2	3.8	0	0	3	11.5	1	2.6	6	4.2
No	50	96.2	28	100	23	88.5	37	97.4	138	95.8

Type of breastfeeding in childhood.

Maternal	33	63.5	12	42.9	11	42.3	10	26.3	66	45.8
Mixed	13	25	7	25	6	23.1	7	18.4	33	22.9
Artificial	6	11.5	7	25	9	34.6	19	50	41	28.5
Do not know,no answer	0	0	2	7.1	0	0	2	5.3	4	2.8

Table 2. Average score and success rate by academic year and overall.

	First year		Second year		Third year		Fourth year		Overall	
	m	**sd**	**m**	**sd**	**m**	**sd**	**m**	**sd**	**m**	**sd**
OS[a]	25.45	±12.82	65.14	±14.08	76.01	±12.64	76.81	±12.64	55.85	±26.53
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
P1. What are the current WHO recommendations for breastfeeding?	11	21.2	15	53.6	22	84.6	33	86.8	81	56.3
P2. What would you say to a pregnant woman who tells you she is considering breastfeeding?	33	63.5	24	85.7	25	96.2	37	97.4	119	82.6
P3. Which of the statements related to mastitis is false?	6	11.5	16	57.1	17	65.4	32	84.2	71	49.3
P4. Which of the following statements is false?	31	59.6	25	89.3	23	88.5	33	86.8	112	77.8
P5: The E- lactancia.org website is for:	1	1.9	2	7.1	9	34.6	0	0	12	8.3
P6: Colostrum is:	24	46.2	25	89.3	26	100	38	100	113	78.5
P7. In a healthy newborn, before breastfeeding in the delivery room, one must weigh the newborn, assess the newborn using the Apgar test, vaccinate the newborn and apply ophthalmic ointment to the newborn.	4	7.7	10	35.7	16	61.5	22	57.9	52	36.1
P8. The mother should offer her breast to the child at a frequency of:	6	11.5	22	78.6	26	100	34	89.5	88	61.1
P9. It is not necessary to wash the mother’s breast before each feeding; a daily shower will suffice.										

18	34.6	12	42.9	18	69.2	33	86.8	81	56.3

P10. Regarding newborn weight loss in the first week of life, what is the standard weight loss that is considered normal.

4	7.7	28	100	25	96.2	37	97.4	94	65.3

P11. ‘Breast analgesia’ should be used for painful procedures performed in the newborn, such as the heel-stick, to relieve pain.

4	7.7	13	46.4	20	76.9	35	92.1	72	50

P12. When evaluating feeding, which sign indicates ineffective latching?

7	13.5	21	75	17	65.4	30	78.9	75	52.1

P13. The following drawing shows an effective latch.

6	11.5	17	60.7	20	76.9	23	60.5	66	45.8

P14. Regarding the position of the infant when feeding, do you consider this an adequate position?

21	40.4	11	39.3	15	57.7	22	57.9	69	47.9

P15. If the baby is unable to find the breast, the mother should push the baby’s head towards the breast to help with the feeding.

18	34.6	17	60.7	17	65.4	27	71.1	79	54.9

P16. The production of breast milk is related to:

21	40.4	27	96.4	24	92.3	37	97.4	109	75.7

P17. How long does it usually take for milk to come in after vaginal delivery?

25	48.1	19	67.9	11	42.3	19	50	74	51.4

P18. Kangaroo care (skin-to-skin method) exerts an important galactagogue effect in:

6	11.5	7	25	12	46.2	21	55.3	46	31.9

P19. Which of the following statements corresponds to a benefit of breastfeeding for the infant?

15	28.8	27	96.4	25	96.2	37	97.4	104	72.2

P20. What is a benefit of breastfeeding for the mother?

11	21.2	24	85.7	25	96.2	33	86.8	93	64.6
P21. In premature babies who are breastfed, there is more:									
6	11.5	21	75	22	84.6	30	78.9	79	54.9

[a] Overall score, relative to 100

Table 3. Relationships between questionnaire's score and sociodemographic and breastfeeding variables.

	m	sd	P value
Sex[a]			0.075
Male	40.827	20.737	
Female	50.776	20.609	
Numeber of children[a]			0.164
0	50.504	20.662	
1	70.738	10.421	
2	50.9524	30.704	
3	40.29	0	
Previous studies[b]			0.239
Vocational training	50.884	10.983	
baccalaureate program	50.429	20.792	
University degree	70.619	20.076	
Academic course[b]			**<0.001**
First-year	20.545	10.282	
Second-year	60.513	10.408	
Third-year	70.600	10.274	
Fourth-year	70.681	10.182	
Related clinical practices[b]			**<0.001**
Yes	70.423	10.455	
No	50.017	20.686	
Breastfeeding experience [a]			0.070
Yes	70.302	10.872	

No	50.511	20.662	
Type of breastfeeding in childhood [b]			**0.008**
Maternal	40.920	20.678	
Mixed	50.382	20.649	
Artificial	60.713	20.290	
Do not know, no answer	60.667	20.489	

[a] U de Mann-Whitney

[b] Kruskal-Wallis